

## Plains Grassland and Plains Forest Ecotype



Figure 22. Plains Grassland and Plains Forest Ecotype

Montana's high eastern plains, part of America's Great Plains, are generally found on high, rolling land and on some scattered hills and in wide river valleys. Some of the rivers in this region, particularly the warmwater sections of the Yellowstone and Missouri in eastern Montana, harbor the most diverse communities of fish in the state. It's a rather harsh environment, with short, hot summers and long, cold winters that bring fewer than 15 inches of precipitation a year. In this environment, the protection offered by woody draws and the unique badlands or "breaks" provide important pockets of habitat and protection for wildlife.

In addition, Montana's unique prairie forests, found in the blistered "island" mountain ranges east of the Rocky Mountains, provide a higher elevation relief where precipitation is sufficient to create closed-canopy forests of Great Plains ponderosa pine and various hardwoods. Although these forests are not islands in the true sense, they are a unique part of the plains landscape.

### Grassland

#### Landscape Characteristics

The plains grassland and plains forest ecotype includes 43,918,691 acres and represents 46.7 percent of Montana. Elevations at the western and southern edges of the plains grassland and plains forest ecotype range between 3,500 and 4,000 feet. Elevations decrease gradually toward the northeast, where the lowest point, 1,900 feet, as the Missouri River exits Montana, is reached. Broad areas less than 2,500 feet lie near the lower Missouri and Yellowstone rivers. For the most part the land is flat or rolling. Steeper dissected topography is found in

various badland areas of the east and southeast and in river breaks areas near the Missouri and Yellowstone and some major tributaries. Two major rivers, the Missouri and the Yellowstone, cross the entire ecotype. Flowing into these rivers are various large tributaries including the Milk, Marias, Powder, Tongue, Bighorn, and Musselshell rivers, all crossing many miles of the plains grassland.

Most of the area north of the Missouri and a little of it to the south, was overridden by the continental glaciers, creating topography that is somewhat smoother and flatter than the plains to the south. Exceptions to this are areas near some of the major rivers where erosion following glaciation dissected the land. Glaciated plains tend to have a relatively large number of small, poorly drained depressions, some of which form potholes or small lakes.

## **Soils**

All soils in the plains grassland ecotype are classified as cool (average annual temperature ranging between 32 and 47 degrees F). Much of the soil in the glaciated plains (approximately north of the Missouri River) part of the ecotype contains large amounts of salt and may also be alkaline. Such soils may be medium textured with distinct topsoil horizons, or they may be heavy clay soils without horizons. The second-largest category of soils in the ecotype includes those that have light-colored topsoil layers and are not particularly saline or alkaline. These soils may or may not have lime layers. Places with somewhat higher effective precipitation (due to greater precipitation and or/ lower evaporation) have dark, well-developed topsoil horizons with a distinct clay layer just beneath that. These tend to be the most fertile and most easily tilled soils in the ecotype.

## **Climate**

The climate of the plains grassland ecotype can be generally characterized as semiarid—cold in winter, warm in summer, and highly variable compared to the remainder of Montana. During much of the winter, Canadian high pressure pushes cold air south over the region. This type of weather pattern produces extremely low temperatures that may persist for days or weeks at a time, as well as low precipitation since moisture-producing weather systems are subsequently routed south. During the summer, low pressure caused by high temperatures may draw moisture in from the Gulf of Mexico. The area is mostly outside of the primary track of Pacific moisture-producing storms except for a period during late spring to early summer.

Mean annual temperatures range from 38 degrees F in some areas in the extreme northeast to 48 degrees F at some places south of the Yellowstone River. The mean for the ecotype is somewhere around 43 to 44 degrees F. Mean January temperatures vary from 2 degrees F in the northeast to 21 degrees F in the south. Mean July temperatures range from 63 to 72 degrees F. The highest

temperatures are along the Yellowstone River, whereas the lowest are in the northwest where the ecotype abuts the intermountain /foothill grassland ecotype. Minimum yearly temperatures upon which plant hardiness zones are based range from minus 38 degrees F in the northeast to minus 24 degrees F in the south. The boundary between hardiness zones 3 and 4 (mean minimum yearly temperatures in the minus 30s and minus 20s respectively) follows a line going approximately from the southeastern corner of Montana to the Sweetgrass Hills. There is no zone 5 in this ecotype. Mean annual maximum temperatures range from 104 degrees F along the lower Yellowstone River to 95 degrees F at the highest elevations of the ecotype in the northwest.

Average annual precipitation in the ecotype ranges from 10 inches in a wide band along most of the highline and a south-central area to 16 inches in some scattered eastern and southern areas. The average for the ecotype is from 12 to 14 inches. Except for some widely scattered isolated areas, the eastern portion of the ecotype tends to receive a greater proportion of its precipitation in the April 1 to July 31 (growing season) period than the west. Except for an area in the northwest, western areas near the mountains receive less than 55 percent of the precipitation in the April to August period, while most areas in the east receive more than 60 percent.

Snowfall ranges from 21 to 40 inches throughout most of the area. The higher snowfalls occur in the portions of the ecotype closest to the mountains. A few isolated areas in the extreme east get less than 20 inches of snow per year. The mean number of days per year when there is at least 1 inch of snow on the ground increases from the western and southern edges of the ecotype to the northeast. The areas with the least number of days of snow cover are in the Chinook zone, where extremely strong and persistent winds during the winter either sublimate or melt the snow. Mean wind speeds vary from 11 to 13 miles per hour over most of the ecotype. Days with snow cover range from less than 60 to more than 120 across the ecotype.

### **Anthropogenic Uses**

The plains grassland ecotype encompasses the largest area in Montana. Recreational activities include hunting, fishing, and snowmobiling. Major industries includes ranching and farming, which produce some of the largest wheat and cattle yields in the country. The breakdown of landowner stewardship for the plains grassland ecotype is as follows:

U.S. Federal Agencies:	6,081,573 acres, or 13.8% of total area, which include:
BLM:	5,083,576 acres, or 11.6% of total area
USFS:	142,889 acres, or 0.3% of total area
USFWS:	716,050 acres, or 1.6% of total area
NPS:	556 acres, or less than 0.1% of total area
State Agencies:	2,886,994 acres, or 6.6% of total area

Tribal Lands:	2,532,892 acres, or 5.8% of total area
Private:	32,190,791 acres, or 73.7% of total area
City and County:	3,027 acres, or less than 0.1% of total area

## Vegetation

On the semiarid plains grasslands, vegetation communities and soil characteristics are strongly associated. The rather uniform climatic conditions across the area dictate that differences in plant community composition are primarily due to the variations in available water-holding capacity of the soils. Soils are organized into categories that reflect annual precipitation as well as water-holding capacity. These categories, called ecological sites, are grouped on the basis of parameters such as texture, slope topographic position, and chemical characteristics. Most of the ecotype is within the 10- to 14-inch precipitation zone, and therefore, textural/topographic/chemical characteristics are the primary regulators of plant community composition.

Within the ecotype there is a relatively small number of grass species that occur as dominants throughout the area. Some of these are found in various amounts in nearly all the communities, whereas others are more specialized and occur only under certain conditions. Other major changes in the grassland communities occur with human management because of differing responses of species to management treatments. In addition to dry land farming, which totally removes native vegetation, range management practices impact native species.

Vegetation found throughout the ecotype includes western wheatgrass (*Agropyron smithii*), needle-and-thread (*Stipa comata*), bluebunch wheatgrass (*Agropyron spicatum*), blue grama (*Bouteloua gracilis*), prairie junegrass (*Koeleria macrantha*), green needlegrass (*Stipa viridula*), thickspike wheatgrass (*Agropyron dasystachyum*), fringed sage (*Artemisia frigida*), and dense clubmoss (*Selaginella densa*). Other widespread species common in certain conditions include little bluestem (*Andropogon scoparius*), prairie sandreed (*Calamovilfa longifolia*), silver sage (*Artemisia cana*), sun-sedge (*Carex stenophylla*), and threadleaf sedge (*Carex filifolia*). Most other grasses and grasslike plants are only minor community components or are dominants in very restricted areas (Ross and Hunter 1976).

In terms of biomass, forbs in plains grassland communities tend to be highly subordinate in most conditions. Certain subshrubs, including fringed sage, broom snakeweed (*Gutierrezia sarothrae*), and prickly pear (*Opuntia polyacantha*) may become dominant members of some communities following overgrazing. Varying amounts of shrubs occur throughout the plains grasslands. However, the areas where shrubs contribute a large and consistent proportion of the biomass have been included in the shrub grassland ecotype.

Patterns of species dispersal and precipitation distribution influence the distribution of some species throughout the ecotype. The bluestems (warm-season grasses) originated farther east in the plains region of the United States and generally do not penetrate much beyond the eastern third of Montana with its more continental pattern of precipitation distribution. Bluebunch wheatgrass originated in the intermountain region of the United States (Barker and Whitman 1988), where spring and winter are wet and summers are dry. Although it is abundant on most sites in the western part of the ecotype, it becomes progressively less abundant and more restricted toward the east. Western wheatgrass, another important plains species, decreases toward the west. The plains grassland ecotype is a zone where mixed prairie species meet some of the Pacific/intermountain bunchgrasses, although the area is primarily dominated by the former (Wright and Wright 1948).

Coarse-textured sandy soils (2 percent of the ecotype) have not had time to form soil cover. Widespread species favored by coarse-textured soils include needle-and-thread, little bluestem, silver sage, and threadleaf sedge (Ross and Hunter 1976) (Hansen et al. 1988). Some other species whose distribution in Montana is mostly restricted to, rather than just favored by, sandy soils, include sand and big bluestems (*Andropogon hallii*, *A. gerardi*), prairie sandreed, Indian ricegrass (*Oryzopsis hymenoides*), sideoats grama (*Bouteloua curtipendula*), and yucca glauca.

Medium-textured soils, described as silty, occupy the greatest (more than 70 percent) range within the ecotype. Silty soils have a good combination of relatively high water-holding capacity as well as high permeability and infiltration rates. Potential natural communities in medium-textured soils in the 10- to 14-inch precipitation zone are dominated by western wheatgrass and needle-and-thread. However, blue grama can become abundant enough during drought periods to become dominant on many sites. This suggests that plant communities in the northern Great Plains with its extreme and variable climate are not static but vary greatly over time. Culwell et al. (1986) sampled grasslands in extreme eastern Montana dominated by western wheatgrass, blue grama, and threadleaf sedge. Western wheatgrass and green needlegrass constitute most coverage with run-in moisture such as swales and footslopes. Bluebunch wheatgrass is a dominant in western areas with western wheatgrass and needle-and-thread becoming much less abundant. Subdominant grasses include prairie junegrass, blue grama, sun sedge, and sometimes thickspike wheatgrass. Plains reedgrass (*Calamagrostis montanensis*) and plains muhly (*Muhlenbergia cuspidate*) may be locally dominant in some western areas. Little bluestem is locally dominant in some areas mostly in the east. The most important forb genera include *Lomatium* and *Astragalus*. In addition to the common species of the rest of the plains grassland, the areas receiving between 15 and 19 inches of annual precipitation allows the establishment of some species for which the surrounding areas are too dry. These include big bluestem (*Andropogon gerardii*) and Idaho fescue (*Festuca idahoensis*). Some plant communities on medium-

textured soils have been altered by cultivation or long periods of heavy grazing. Heavy grazing increases blue grama, fringed sage, clubmoss, prairie junegrass, and cheatgrass (*Bromus tectorum*) at the expense of wheatgrass and sometimes needle-and-thread.

Fine-textured soil constitutes a little more than 18 percent of the ecotype and is less favorable to species like needle-and-thread, prairie junegrass, and blue grama, although they will likely persist if adequate topsoil exists and is maintained. The finest textured soils with little or no topsoil support mostly western wheatgrass, green needlegrass, thickspike wheatgrass, and bluebunch wheatgrass in central and western parts of the ecotype (Ross and Hunter 1976). The heaviest clay soils are also usually saline and possibly alkaline. Species not adapted to such conditions are prevented from establishing and are replaced by facultative or obligate halophytes such as western wheatgrass, saltgrass (*Distichlis stricta*), green needlegrass, Nuttall saltbush (*Atriplex nuttallii*), and greasewood (*Sarcobatus vermiculatus*). In low-lying areas, species favored by periodic flooding occur. These include Nuttall alkaligrass (*Puccinellia nuttalliana*) and alkali cordgrass (*Spartina gracilis*). Areas of fine-textured soils in the plains that receive greater (15 to 19 inches) precipitation than the rest of the area share many of the dominant species as the adjacent foothill regions as well as those of the rest of the plains ecotype. These foothill species include bluebunch wheatgrass and Idaho fescue. Big bluestem occurs in the easternmost areas.

Topographically complex areas in the plains grassland ecotype include the river breaks and badlands areas, which are difficult to categorize vegetationally. Bluebunch wheatgrass and western wheatgrass tend to be dominant grasses in most areas. Little bluestem, prairie sandreed, needle-and-thread, and green needlegrass may be locally abundant. Shrubs and conifers may be locally important, especially in the breaks. Common shrubs include big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*), rubber rabbitbrush (*Chrysothamnus nauseosus*), aromatic (skunkbush) sumac (*Rhus aromatica*), snowberry (*Symphoricarpos occidentalis*), and Nuttall saltbush. Draws in the extreme eastern part of the ecotype provide habitat for certain woody species not normally found elsewhere except in the Midwest. The tree most commonly encountered is green ash (*Fraxinus pennsylvanica*). Quaking aspen (*Populus tremuloides*) is occasionally found, and bur oak (*Quercus macrocarpa*) occurs in drainages of the extreme southeast (Hansen et al. 1988). Chokecherry and snowberry are shrubs commonly found in these situations. Relatively small timber stands are found scattered throughout most of the breaks area. Both ponderosa pine (*Pinus ponderosa*) and Douglas-fir (*Pseudotsuga menziesii*) occur in these stands as far east as 108.5 degrees longitude; east of this point Douglas-fir drops out. The occurrence of these conifer species in the breaks is due to topographic conditions since the area does not receive any more precipitation than the surrounding plains. A typical timber stand in the breaks forms a closed canopy consisting of ponderosa pine and Douglas-fir. The

understory shrub component is composed of some or all of the following: snowberry, aromatic sumac, chokecherry (*Prunus virginiana*), rose (*Rosa nutkana*), and Rocky Mountain juniper (*Juniperus scopulorum*). Frequent stand-replacing fires in the area result in communities composed of these shrub species but minus the tree overstory. Forbs and grasses include western yarrow (*Achillea millefolium*), aster (*Aster falcatus*), rose pussytoes (*Antennaria microphylla*), bluebunch wheatgrass, and plains muhly (*Muhlenbergia cuspidate*).

## **Forest**

### **Landscape Characteristics**

The plains forest ecotype includes 3,266,564 acres and represents 3.5 percent of Montana. Forested areas in the plains generally occupy higher areas that represent erosional remnants of resistant rock layers, particularly the Arikaree Formation near Ekalaka. These rock layers are younger than the layers supporting the surrounding grasslands (Ross et al. 1955). The stands of plains forest are located on hilly regions, mostly in the southern half of the plains portion of Montana. These hilly regions may be enough higher than surrounding grasslands, such that there is increased annual precipitation capable of supporting forests. Such hilly topography may also create topoedaphic conditions suitable for the establishment of tree cover. The difference in elevation between the forested hills and the adjacent grasslands is not great, generally in the neighborhood of a few hundred feet to at most 2,000 feet. Elevation differences much greater than this would generally result in a montane forest site. The forests of the Chalk Buttes, Longpines, and area near Hammond result from hills and/or buttes rising several hundred feet above base elevations of about 3,200 to 3,500 feet. The large forested area just east of Ashland occupies hills rising from low elevations of about 3,000 feet near the Tongue River to approximately 4,400 feet. The extensive forested region extending from near Custer through Lame Deer to Birney ranges in elevation from 4,000 to 5,000 feet. The lowest elevation of the Bull Mountains forested area is roughly 3,000 feet at points along the Musselshell River. Highest elevations are a little more than 4,000 feet. Most of the other scattered plains forest stands are due to elevation rises of a few to several hundred feet (e.g., east of Miles City, south of Rosebud, and north of Rapelje), topoedaphic effects (e.g., along the Yellowstone River near Columbus), or proximity to mountain areas (e.g., Longpines and Chalk Buttes).

## **Soils**

The largest single category (80 percent) of soils occurring within the plains forest ecotype is described as having a relatively light-colored, thin topsoil horizon. Lime layers may be present if the parent material is calcareous. On the wettest sites (2.5 percent), the soil characteristics of montane forests are found. These tend to be acid with a duff layer (partially decomposed leaves, etc.) on top and a reddish brown clay layer beneath that. The remaining major category of soils is

the one where shale is the parent material.

## **Climate**

The overall climate of the plains forest ecotype is determined by the same factors as the plains grassland, except that elevations of this ecotype are higher. These higher elevations have the effect of lowering temperatures and increasing yearly precipitation, allowing the establishment of forest.

Mean annual temperatures in the areas of plains forests generally are about 1 to 2 degrees F lower than the adjacent grasslands. In most cases this means temperatures from 43 to 44 degrees F. Since most of these are in the southern or western parts of the state, their annual temperatures are several degrees higher than at lower elevations in the northeast. January temperatures generally are 1 to 2 degrees lower than the surrounding grasslands, while July temperatures may be 3 to 4 degrees lower. This suggests that the slight differences in elevation have more effect on summer temperatures than winter temperatures.

Total annual precipitation over the entire ecotype averages approximately 14.5 inches. Some of the wettest areas receive more than 20 inches of annual precipitation. There does not appear to be any difference in the proportion of precipitation received during the growing season as compared to the adjacent lower elevation grasslands. Depending on exact location, May or June is the wettest month of the year and February is the driest.

The average frost-free season is typically shorter than that of the adjacent plains grasslands due to higher elevations and the reduction of overall temperatures. The frost-free season ranges from 90 to 115 days.

## **Anthropogenic**

The plains forest ecotype is the smallest in landmass of the five major ecotypes. Recreational opportunities abound in these large pockets of forest. Activities include hiking, biking, snowmobiling, hunting, cross-country skiing, and wildlife watching. The primary industries in the area are livestock grazing, mining, and some timber extraction. The breakdown of landowner stewardship for the plains forest ecotype is as follows:

U.S. Federal Agencies:	547,647 acres, or 17.9% of total area, which include:
BLM:	156,850 acres, or 5.1% of total area
USFS:	390,797 acres, or 12.8% of total area
State Agencies:	155,059 acres, or 5.1% of total area
Tribal Lands:	285,716 acres, or 9.4% of total area
Private:	2,222,219 acres, 72.7% of total area



## Vegetation

The plains forest ecotype occupies 4,610 square miles. The ecotype was intended to include only areas with relatively large contiguous tracts of potential forestland. The Missouri breaks woodlands are included with the plains grassland ecotype described earlier in this document. Because the plains forest areas are somewhat higher in elevation than the surrounding plains grassland, precipitation conditions (a combination of higher total amounts plus a favorable growing season wet moisture distribution) favor the establishment of a closed canopy forest.

Great Plains ponderosa pine (*Pinus ponderosa* var. *scopulorum*) is the sole conifer forming the plains forest ecotype, although various hardwood tree species (e.g., American elm [*Ulmus Americana*], green ash [*Fraxinus pennsylvanica*], American plum, [*Prunus Americana*], and bur oak [*Quercus macrocarpa*]) occur along some of the draws and ravines. In contrast to the ponderosa pine west of the Continental Divide, this variety tends to be shorter. Maximum tree heights range from 35 to 60 feet in dry situations and as much as 95 feet where there is more moisture (Arno 1979). Microclimatic conditions may be favorable in some places for Douglas-fir (*Pseudotsuga menziessii*), to establish, but apparently seed sources are too distant. The drier forests tend to be relatively open and support mostly grass understories. Grasses commonly found in these situations include little bluestem (*Andropogon scoparius*), big bluestem (*Andropogon gerardii*), bluebunch wheatgrass (*Agropyron spicatum*), blue grama (*Bouteloua gracilis*), and threadleaf sedge (*Carex filifolia*). Moist forests contain understory species common to montane forests to the west. Species include Canada buffaloberry (*Shepherdia canadensis*), kinnikinnick (*Arctostaphylos uvaursi*), Oregon grape (*Mahonia repens*), twinflower (*Linnaea borealis*), heartleaf arnica (*Arnica cordifolia*), fairy bells (*Disporum trachycarpum*), wintergreen (*Pyrola secunda*), and false Solomon's seal (*Smilacina stellata*).

## Terrestrial Conservation Focus Areas in Greatest Need (Tier I)

### Missouri Coteau (5,278,913 acres)



Figure 23. Missouri Coteau Focus Area

The Missouri Coteau area represents part of the large continental prairie grassland and pothole habitat that occurs in eastern Montana. This portion of Montana's prairie pothole country contains the highest density of natural wetlands. In most years springtime finds this area dotted with small wetlands. These shallow wetlands shine amongst the small glacial hilltops that are covered with short- to mid-grass prairie species. The density of wetlands on the landscape are unique to Montana, leading to diverse wildlife and vegetative species. This is the main portion of Montana that is considered to be part of the North American duck factory, the other being areas north of Chinook.

### Landscape Characteristics

This area consists of hummocky plains, outwash and stream terraces, fans, and floodplains that formed in thin glacial till and river sediments that lie over shale, siltstone, and sandstone. Moraines, kames, kettles, and small lakes also occur. Elevations range from 1,650 to 3,050 feet. Drainage density is moderate. Mean annual precipitation ranges from 12 to 15 inches, with about 20 percent falling as snow. The soil temperature and moisture regimes are frigid and udic. Primary natural disturbances include extended droughts, insects, and severe storms. Another important natural disturbance regime is prairie dog complexes. Land use is predominantly wheat farming and range and pasture lands. The breakdown for land stewardship in the Missouri Coteau area is as follows:

U.S. Federal Agencies:	147,337 acres, or 2.8% of total area, which include:
BLM:	117,375 acres, or 2.2% of total area

USFWS:	29,900 acres, or 0.6% of total area
NPS:	62 acres, or less than 0.1% of total area
State Agencies:	386,782 acres, or 7.3% of total area
Tribal Lands:	691,154 acres, or 13.1% of total area
Private:	4,040,173 acres, or 76.5% of total area
County and City:	62 acres, or less than 0.1% of total area

### Associated Habitats

Habitat	Habitat Tier	Percentage of Area
Moderate/High Cover Grasslands	I	3.57
Agricultural Lands - Irrigated	III	5.39
Wetland and Riparian	I	6.13
Altered Herbaceous	II	12.69
Low/Moderate Cover Grasslands	I	27.71
Agricultural Lands - Dry	III	36.19

Note: A total of 91.69% of the Missouri Coteau area is represented; 8.31% is made up of a combination of other habitat types.

### Associated Species of Greatest Conservation Need (Tier I Species)

There are a total of 318 terrestrial vertebrate species that are found within the Missouri Coteau Focus Area. Tier I species are listed below. All associations can be found in Table 27.

**Amphibians:** Northern Leopard Frog

**Reptiles:** Snapping Turtle, Spiny Softshell, Western Hog-nosed Snake, and Smooth Greensnake

**Birds:** Common Loon, Trumpeter Swan, Bald Eagle, Yellow Rail, Whooping Crane, Piping Plover, Long-billed Curlew, Interior Least Tern, Black Tern, Burrowing Owl, Sedge Wren, and Nelson's Sharp-tailed Sparrow

**Mammals:** Townsend's Big-eared Bat and Meadow Jumping Mouse

### Conservation Concerns & Strategies

Conservation Concerns	Conservation Strategies
Loss of habitat due to conversion of native prairie to small grain crops	Policy-based approaches that encourage the conservation of natural communities, rather than support their conversion

	Support public and private conservation programs/activities that encourage and support private land use stewardship
	Increased cooperative efforts to maintain ecological features or processes on public, private, and tribal lands
Drainage of natural wetlands	Participate in government and private conservation partnerships to reduce the loss of wetland habitat and restore lost wetlands
Invasive or exotic plant species	Cooperative efforts to reduce the abundance of exotic plant species
Disruption of natural disturbance processes, especially fire	Work with other agencies, tribes and private organizations to restore the natural disturbance processes
Fragmentation of habitat due to fossil fuel exploration and development activities	Work with corporations, land owners and other agencies to reduce impacts of exploration
	Education and research on fossil fuel development and its impacts on natural landscape

## References

The Nature Conservancy. 2005. Unpublished report.

The Nature Conservancy. 1999. Ecoregional Conservation in the Northern Great Plains Steppe. Northern Great Plains Steppe Ecoregional Planning Team. 76 pp.

U.S. Fish and Wildlife Service. 2004. Conservation Focus Areas of the Great Divide: a vast region encompassing the Upper Missouri, Yellowstone and upper Columbia watersheds. Publisher: USFWS, Benton Lake Wildlife Refuge, Great Falls, MT. 77 pp.

## Montana Sedimentary Plains (13,828,142 acres)

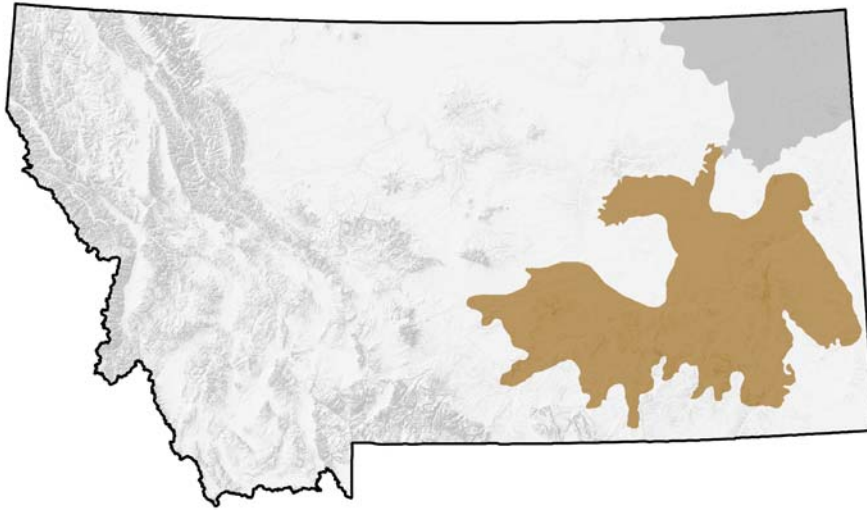


Figure 24. Montana Sedimentary Plains Focus Area

The gently sloping to rolling Montana Sedimentary Plains area contains scattered buttes and badlands. It sits on heavy clay soils and consists of mostly dry shrublands and mixed-grass prairies. It receives very little precipitation and is interspersed with woody draws that contain ponderosa pine, juniper, and snowberry. Agricultural practices can be found throughout the area that support many dryland native wildlife species such as antelope, mule deer, and greater sage-grouse.

### Landscape Characteristics

This area includes plains and hills formed in residuum and alluvium from shale and sandstone. Some lacustrine sediments also occur. Elevations range from 2,100 to 4,150 feet. Drainage density is moderate. Mean annual precipitation ranges from 10 to 14 inches, with about 30 percent falling as snow. Soil temperature and moisture regimes are frigid and arctic ustic. The primary natural disturbances are fire and drought. Other important natural biotic disturbances include beaver activity in riparian areas and prairie dog complexes in grassland areas. Land use is predominantly livestock grazing with a small amount of dryland farming. The breakdown for land stewardship in the Montana Sedimentary Plains area is as follows:

U.S. Federal Agencies:	1,617,799 acres, or 11.7% of total area, which include:
BLM:	1,414,184 acres, or 10.2% of total area
USFS:	134,240 acres, or 1% of total area
USFWS:	10,934 acres, or less than 0.1% of total area
NPS:	680 acres, or less than 0.1% of total area
State Agencies:	792,405 acres, or 5.7% of total area

Tribal Lands: 566,427 acres, or 4.1% of total area  
 Private: 10,822,908 acres, or 78.3% of total area  
 County and City: 1,050 acres, or less than 0.1% of total area

### Associated Habitats

Habitat	Habitat Tier	Percentage of Area
Xeric Shrub Grassland Associations	I	2.31
Moderate/High Cover Grasslands	I	2.42
Very Low Cover Grasslands	I	2.71
Agricultural Lands - Irrigated	III	2.86
Ponderosa Pine	II	4.52
Wetland and Riparian	I	4.64
Badlands	II	4.66
Sagebrush	I	6.77
Agricultural Lands - Dry	III	9.06
Mixed Xeric Shrubs	I	10.47
Low/Moderate Cover Grasslands	I	41.13

Note: A total of 91.54% of the Montana Sedimentary Plains area is represented; 8.46% is made up of a combination of other habitat types.

### Associated Species of Greatest Conservation Need (Tier I Species)

There are a total of 346 terrestrial vertebrate species that are found within the Montana Sedimentary Plains Focus Area. Tier I species are listed below. All associations can be found in Table 28.

**Amphibians:** Northern Leopard Frog

**Reptiles:** Snapping Turtle, Spiny Softshell, Western Hog-nosed Snake, and Milksnake

**Birds:** Common Loon, Bald Eagle, Greater Sage-Grouse, Whooping Crane, Mountain Plover, Long-billed Curlew, Interior Least Tern, Black Tern, and Burrowing Owl

**Mammals:** Spotted Bat, Townsend's Big-eared Bat, Black-tailed Prairie Dog, Meadow Jumping Mouse, Black-footed Ferret, Canada Lynx, and American Bison

## Conservation Concerns & Strategies

Conservation Concerns	Conservation Strategies
Loss of habitat as a result of conversion of native prairie to agriculture	Policy-based approaches that encourage the conservation of natural communities, rather than support their conversion
	Support public and private conservation programs/activities that encourage and support private land use stewardship
	Increased cooperative efforts to maintain ecological features or processes on public, private, and tribal lands
Fragmentation of habitat due to fossil fuel exploration and development activities	Education and research on fossil fuel development and its impacts on natural landscape
	Work with corporations, land owners and other agencies to reduce impacts of exploration
Invasive or exotic plant species	Cooperative efforts to reduce the abundance of exotic plant species
Range or forest management practices	Support government and private conservation activities that encourage and support sustainable land management practices (example; rest and rotation schedules)
Streamside residential development	Develop statewide riparian best management principles
Disruption of natural disturbance processes, especially fire	Work with other agencies, tribes and private organizations to restore the natural disturbance processes

## References

The Nature Conservancy. 2005. Unpublished report.

The Nature Conservancy. 1999. Ecoregional Conservation in the Northern Great Plains Steppe. Northern Great Plains Steppe Ecoregional Planning Team. 76 pp.

U.S. Fish and Wildlife Service. 2004. Conservation Focus Areas of the Great Divide: a vast region encompassing the Upper Missouri, Yellowstone and upper Columbia watersheds. Publisher: USFWS, Benton Lake Wildlife Refuge, Great Falls, MT. 77 pp.

## Aquatic Conservation Focus Areas in Greatest Need (Tier I)

### Lower Missouri River (175 River Miles)



Figure 25. Lower Missouri River Focus Area

The Lower Missouri River area consists of badlands, breaks, coulees, and gently rolling hills. The river runs approximately 180 river miles from Fort Peck Dam to the North Dakota border. The section of river from the dam to the town of Wolf Point is uncharacteristically cool and clear, as water discharged from the bottom of the reservoir is devoid of sediment and very cold. Along with many native fish species, this area is occupied by non-native trout species. Even with flows from the Milk River, this section does not return to warmwater habitat until it reaches the town of Wolf Point, approximately 70 river miles downstream. From here to the North Dakota border the Missouri remains warm, with warmwater tributaries like the Poplar River, Red Water River, and Big Muddy Creek. The adjacent land along the Lower Missouri is primarily cottonwood-willow bottomlands and irrigated cropland. As with the area immediately below Fort Peck Dam, this area supports paddlefish, pallid sturgeon, shovelnose sturgeon, sauger, goldeye, and blue sucker, along with many other native fish species.

#### Associated Habitats

Habitat Type	Habitat Tier	Acres	Miles
Lowland Lakes	III	3,021	
Lowland Reservoirs	III	374	
Mixed Source Rivers (Intermountain and Prairie Flow)	II		175
Prairie Streams	I		3,228



### Associated Species of Greatest Conservation Need (Tier I Species)

There are a total of 55 aquatic species that are found within the Lower Missouri River Focus Area. Tier I species are listed below. All associations can be found in Table 29.

**Fish:** Pallid Sturgeon, Paddlefish, Shortnose Gar, Sturgeon Chub, Sicklefin Chub, Pearl Dace, Blue Sucker, Burbot, and Sauger

### Conservation Concerns & Strategies

Conservation Concerns	Conservation Strategies
Culverts, dams, irrigation diversions, and other instream barriers that fully or partially impede fish movement and reduce connectivity of habitat	Removal or modification of barriers in a manner that restores fish passage to ensure full migratory movement
Modification and degradation of stream channels caused by various construction or land management practices	Restoration of stream channels or streambanks to a condition that simulates their natural form and function
Riparian vegetation effected by range and forest management practices and streamside residential development (such activities destabilize streambanks, increase sediment inputs, reduced shading, and remove woody debris)	Support government and private conservation activities that encourage and support sustainable land management practices in riparian areas
	Modification of riparian management practices such that riparian vegetation is allowed to recover
	Develop statewide riparian best management principles
Entrainment of juvenile and adult fishes by irrigation diversions or other water intakes	Screening or modification of irrigation diversions or other water intakes in a manner that prevents entrainment of fishes
Alterations of the quantity or timing of stream flows, causing dewatering or unnatural flow fluctuations that diminish the quantity or quality of essential habitats	Implementation of various water conservation or flow management practices that restore essential habitats and simulate the natural hydrograph
Water chemistry problems that arise due to municipal discharge, irrigation return water, and other sources	Work with municipal government and private landowners to reduce point source pollutants

Unnatural hydrograph and water temperatures associated with the presence and operations of large dams	Work with appropriate authorities to restore hydrograph that mimics the natural regime
Non-native fish species	Support activities to promote natural habitats that support native species

## Lower Yellowstone River (278 River Miles)



Figure 26. Lower Yellowstone River Focus Area

The French used the term *Roche Jaune*, meaning “yellow rock,” to describe the lower section of the Yellowstone River, which is lined with trees and meanders through yellow bluffs and rimrocks on its journey toward North Dakota. This reach of the river cuts through a country of plateaus and wind-carved sandstone. By the time the Yellowstone reaches the mouth of the Bighorn River, it has turned from a crystal clear, cold mountain stream into a warm plains river. As it flows north and east, it picks up strength from the Powder and Tongue rivers. In the Lower Yellowstone are found species such as sauger, burbot, and paddlefish.

### Associated Habitats

Habitat Type	Habitat Tier	Acres	Miles
Lowland Lakes	III	6,577	
Lowland Reservoirs	III	1,119	
Mixed Source Rivers (Intermountain and Prairie Flow)	II		278
Mountain Lakes	III	251	
Mountain Reservoirs	III	177	
Prairie Streams	I		11,326

### Associated Species of Greatest Conservation Need (Tier I Species)

There are a total of 65 aquatic species that are found within the Lower Yellowstone River Focus Area. Tier I species are listed below. All associations can be found in Table 30.

**Fish:** Pallid Sturgeon, Paddlefish, Shortnose Gar, Sturgeon Chub, Sicklefin Chub, Pearl Dace, Blue Sucker, Burbot, and Sauger

### Conservation Concerns & Strategies

Conservation Concerns	Conservation Strategies
Dewatering as a result of water diversion	Work with public and private land owners to improve efficiency of water use in order to maximize water return
	Protect instream flow reservations
Water chemistry problems due to irrigation return water and the discharge of wastewater from coal bed methane operations, and other sources	Support cooperative efforts to minimize impacts of return water due to sedimentation, increased salinity and temperature alteration
Riprap and other streambank stabilization work	Work with new stabilization projects to reduce impacts and support efforts to restore existing rip-rap areas to natural condition
	Develop statewide riparian best management principles
Invasive non-native fish species	Programs to control invasive species and promote natural habitats that support native species
Entrainment of juvenile and adult fishes by irrigation diversions or other water intakes	Screening or modification of irrigation diversions or other water intakes in a manner that prevents entrainment of fishes
Riparian vegetation effected by range and forest management practices and streamside residential development (such activities destabilize streambanks, increase sediment inputs, reduced shading, and remove woody debris)	Support government and private conservation activities that encourage and support sustainable land management practices in riparian areas
Modification and degradation of stream channels caused by various construction or land management practices	Restoration of stream channels or streambanks to a condition that simulates their natural form and function

	Modification of riparian management practices such that riparian vegetation is allowed to recover
	Develop statewide riparian best management principles
Alterations of the quantity or timing of stream flows, causing dewatering or unnatural flow fluctuations that diminish the quantity or quality of essential habitats	Implementation of various water conservation or flow management practices that restore essential habitats, simulate the natural hydrograph and also protect instream flows
Culverts, dams, irrigation diversions, and other instream barriers that fully or partially impede fish movement and reduce connectivity of habitat	Removal or modification of barriers in a manner that restores fish passage

## Powder River (220 River Miles)



Figure 27. Powder River Focus Area

The Powder River, a warm prairie river, originates along the eastern slopes of the Bighorn Mountains in Wyoming. Flowing 220 miles to reach the Yellowstone River, the Powder is aptly named, as it is rich in sediment load. A major spawning tributary for native fishes found in the Yellowstone system, the Powder River provides spawning and nursery habitat for sauger, shovelnose sturgeon, channel catfish, and many cyprinid minnow species. The flow regime of this river system can fluctuate from more than 2,000 cfs during the March spring snowmelt period to less than 5 cfs during the hot summer days of August. Fish in this prairie river system have evolved to utilize the Powder during periods of high flow. Sauger tagged in the Yellowstone River have been recaptured in Clear Creek, a headwater tributary to the Powder, equating to more than 220 miles of travel.

### Associated Habitats

Habitat Type	Habitat Tier	Acres	Miles
Lowland Lakes	III	926	
Lowland Reservoirs	III	80	
Prairie Rivers	II		220
Prairie Streams	I		3,703

### Associated Species of Greatest Conservation Need (Tier I Species)

There are a total of 38 aquatic species that are found within the Powder River Focus Area. Tier I species are listed below. All associations can be found in Table 31.

**Fish:** Sturgeon Chub, Burbot, and Sauger

### **Conservation Concerns & Strategies**

Conservation Concerns	Conservation Strategies
Dewatering as a result of water diversion	Work with public and private land owners to improve efficiency of water use in order to maximize water return
	Protect instream flow reservations
Water chemistry problems due to irrigation return water and the discharge of wastewater from coal bed methane operations, and other sources	Support cooperative efforts to minimize impacts of return water due to sedimentation, increased salinity and temperature alteration
	Careful study waters entering the Powder River as a result of coal bed methane development in both Montana and Wyoming
Riprap and other streambank stabilization work	Work with new stabilization projects to reduce impacts and support efforts to restore existing rip-rap areas to natural condition
	Develop statewide riparian best management principles
Invasive non-native fish species	Programs to control invasive species and promote natural habitats that support native species
Entrainment of juvenile and adult fishes by irrigation diversions or other water intakes	Screening or modification of irrigation diversions or other water intakes in a manner that prevents entrainment of fishes
Riparian vegetation effected by range and forest management practices and streamside residential development (such activities destabilize streambanks, increase sediment inputs, reduced shading, and remove woody debris)	Support government and private conservation activities that encourage and support sustainable land management practices in riparian areas
Modification and degradation of stream channels caused by various construction or land management practices	Restoration of stream channels or streambanks to a condition that simulates their natural form and function
	Modification of riparian management practices such that riparian vegetation is allowed to recover

	Develop statewide riparian best management principles
Alterations of the quantity or timing of stream flows, causing dewatering or unnatural flow fluctuations that diminish the quantity or quality of essential habitats	Implementation of various water conservation or flow management practices that restore essential habitats, simulate the natural hydrograph and also protect instream flows
Culverts, dams, irrigation diversions, and other instream barriers that fully or partially impede fish movement and reduce connectivity of habitat	Removal or modification of barriers in a manner that restores fish passage



## Tongue River (221 River Miles)



Figure 28. Tongue River Focus Area

The headwaters of the Tongue River rise in the Bighorn Mountains of Wyoming. From these sources the river flows northeast to its confluence with the Yellowstone River at Miles City. A major spawning tributary for native fishes found in the Yellowstone system, the Tongue River provides spawning and nursery habitat for sauger, shovelnose sturgeon, channel catfish, and many cyprinid minnow species. The 3,500-acre Tongue River Dam controls the river's flow in Montana. Above the reservoir, the river meanders through a broad open valley. Here its main features are turbid water, slow velocity gravel and mud bottoms, and warm water temperatures. Downstream from the dam, the river flows for 10 miles through a narrow, restrictive canyon with increasing gradient and accompanying cooler water temperatures and gravel bottoms. The Tongue River again becomes a slow, meandering valley stream for its last 179 miles.

### Associated Habitats

Habitat Type	Habitat Tier	Acres	Miles
Lowland Lakes	III	665	
Lowland Reservoirs	III	2,176	
Mountain Lakes	III	54	
Prairie Rivers	II		221
Prairie Streams	I		4,843

### **Associated Species of Greatest Conservation Need (Tier I Species)**

There are a total of 49 aquatic species that are found within the Tongue River Focus Area. Tier I species are listed below. All associations can be found in Table 32.

**Fish:** Paddlefish, Sturgeon Chub, Blue Sucker, Burbot, and Sauger

### **Conservation Concerns & Strategies**

Conservation Concerns	Conservation Strategies
Dewatering as a result of water diversion	Work with public and private land owners to improve efficiency of water use in order to maximize water return
	Protect instream flow reservations
Water chemistry problems due to irrigation return water and the discharge of wastewater from coal bed methane operations, and other sources	Support cooperative efforts to minimize impacts of return water due to sedimentation, increased salinity and temperature alteration
	Careful study waters entering the Tongue River as a result of coal bed methane development in both Montana and Wyoming
Entrainment of juvenile and adult fishes by irrigation diversions or other water intakes	Screening or modification of irrigation diversions or other water intakes in a manner that prevents entrainment of fishes
Riparian vegetation effected by range and forest management practices and streamside residential development (such activities destabilize streambanks, increase sediment inputs, reduced shading, and remove woody debris)	Support government and private conservation activities that encourage and support sustainable land management practices in riparian areas
Modification and degradation of stream channels caused by various construction or land management practices	Restoration of stream channels or streambanks to a condition that simulates their natural form and function
	Modification of riparian management practices such that riparian vegetation is allowed to recover
	Develop statewide riparian best management principles

Alterations of the quantity or timing of stream flows, causing dewatering or unnatural flow fluctuations that diminish the quantity or quality of essential habitats	Implementation of various water conservation or flow management practices that restore essential habitats, simulate the natural hydrograph and also protect instream flows
Culverts, dams, irrigation diversions, and other instream barriers that fully or partially impede fish movement and reduce connectivity of habitat	Removal or modification of barriers in a manner that restores fish passage
Loss of species (mountain whitefish and mountain sucker) below Tongue River Dam due to de-watering and drought	Support cooperative efforts to increase water flow and reduce barriers to migration specifically affecting these species